The Political Economy of Illegal Migration: Minimum Wages and Migrants' Cheaper Labour

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Abstract

This paper provides an economic rationale for the tolerance of some level of illegal immigration by many developed countries. Illegal migrants can be easily hired with informal contracts that do not respect labour market regulations, such as minimum wage. Informal employment of illegal migrants allows increases in production and capital revenues above the levels in which marginal labour productivity equals the minimum wage without depressing natives' wages, protected by the regulation. Using a standard general equilibrium model, we show that in presence of minimum wage regulations, optimal migration policy may include both legal and illegal migrants.

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"*The reality is that if the government were able to stop everybody at the border, there would be no agriculture. You wouldn't be eating asparagus*."

Walsh (1999)[1]

"Illegal immigration is a persistent phenomenon in part because it has a strong economic rationale."

Hanson, (2007: 32)

"Policies designed to curb international migration benefit employers who hire undocumented migrants to avoid complying with existing pay and working conditions regulations."

Tacoli and Okali (2001)

1. Introduction

In a period of growing globalization and international labour mobility, illegal immigration has become a widespread phenomenon, that often covers the first page of several newspapers and that is gaining importance in governments' policy agendas. The collapse of communism, economic instability in emerging economies and more recently the Arab revolutions have led to new inflows of illegal migrants in many Western countries. Controversial feelings are associated with illegal immigration: the convenience of their cheap labour force, particularly in low-wage sectors, such as home care or agriculture, is opposed to the perception of illegal immigrants as a source of crime and terrorism and as a burden for host countries' welfare system.

The official position of all governments is that illegal immigration, together with organized crime, drug trafficking and terrorism, is a serious problem that needs to be combated. Various tools are used in this respect, from border patrols to sanctions for illegal employment of foreigners, from deportations and regularisations to readmission agreements with the source

[1] Quoted in Hanson and Spilimbergo (2001).

country, and even, as has been observed recently, the granting of temporary visas to new migrants, hoping they would leave to other countries in the passport-free Schengen area. Such signals of strong commitment to combat illegal immigration may be appealing to the popular electorate, particularly during economic downturns at home or political unrest in source countries, as can be witnessed by the recent rise of anti-immigrant parties across Europe.

Despite these official positions, recent estimates suggest that illegal immigration is a deeply-rooted and widespread phenomenon. In 2008, the estimated stock of illegal migrants was 1.200.000 in the United States (32,4% of the foreign population), 650.000 in Italy (22.1% of the foreign population), 725.000 in the UK (11.1% of the foreign population), 570.000 in Spain (10.9% of the foreign population) and 250.000 in Greece (43,8% of the foreign population).[2] The presence of important numbers of illegal immigrants in many developed countries may have two main reasons: either their governments are unable to reduce illegal immigration levels, due to institutional or budget constraints, or they are unwilling to do so, for political-economic concerns. This paper argues that the second reason is part of the explanation.

Most illegal migrants participate in the host country's economy. They represent a significant source of labour supply, particularly in low-wage sectors such as agriculture, construction, food processing, restoration and home care. These sectors would be severely hurt if they were deprived of unauthorised migrants' labour force. Interest groups in these sectors may therefore lobby governments to turn a blind eye on illegal immigration. But if these industries need labour supply, why don't governments increase the level of legal migration? Instead of tolerating illegal immigration, governments could simply offer more visas to thousands of Latin Americans, East Europeans or North Africans willing to work in a Western country. While part

[2] Figures taken from Fasani (2009).

of the explanation may be electoral, as argued by Facchini and Testa (2010), there are also non-negligible economic considerations. The most important one is related to the existence of minimum wage regulations in the host country. When these regulations are binding, i.e. the marginal labour productivity has reached the minimum wage, production can only be increased by informally employing workers at wages below the regulation. Illegal migrants are then more convenient than legal migrants because they are easier to be hired informally.[3] A secondary economic rationale for increasing labour supply with illegal rather than legal immigration is related to public finances in the host country. As some illegal immigrants pay taxes, but many social welfare benefits are conditional to legally residing in the host country (OECD, 1999), illegal immigration may in some cases be more convenient for public finances. We formalize these two arguments in a simple theoretical framework.

This paper is related to the literature on the impact of migration on the host country and on the political economy of immigration policies. The seminal paper by Borjas (1995), shows that if migrants bring no capital with them, immigration increases total income in the host country, but also generates a redistribution of wealth from labour to capital revenues. If migrants bring some capital with them, the impact of immigration on total income of natives and on its redistribution between labour and capital owners is lower. A number of papers have developed political economy models of immigration policies. Benhabib (1996) analyses how immigration policies that impose capital requirements to migrants would be determined under majority voting, when natives differ in their capital holdings. Amagashie (2004) models an immigration lobbying contest between a firm and a union and shows how the reservation wage of immigrants, the cost of lobbying, and the price of the firm's product affect the permissible number of

[3] 40% of illegal migrants in Italy are paid less that 5 euros per hour, against less than 10% of legal migrants (La Repubblica, 01/02/2010).

immigrants. Facchini and Willman (2005) examine policies restricting international factor mobility when domestic groups bid for protection and the government maximizes a welfare function that depends both on voters' welfare and on contributions from interest groups. Epstein and Nitzan (2006) analyze how lobbying, the weight of total welfare in government's objective function and the possibility for the government to intervene in the policy proposal determine migration quotas. All these papers only considered legal migration.

Another strand of the literature has focused on illegal immigration and has studied optimal policies when the government wants to limit the flow of illegal immigrants. The pioneering paper of Ethier (1986) analyses the effectiveness of border versus internal enforcement in combating illegal immigration. In that model, skilled and unskilled workers are used to produce a final good via a neoclassical production function. Illegal immigrants increase the supply of unskilled workers. Firms employ unskilled labour up to the point in which the wage equals the marginal labour productivity. In absence of wage rigidities, illegal immigration reduces the unskilled wage and increases the skilled wage. In presence of wage rigidities, it increases unskilled unemployment rate without affecting the skilled workers. Border enforcement, modelled as the probability for an illegal entry attempt to fail, determines the supply of illegal migrants. Internal enforcement, modelled as the probability for a firm employing an illegal worker to be caught and pay a fine, determines the wage gap between illegal migrants and unskilled legal workers. The model shows that using a mix of border and internal enforcement is less costly than using only one type of enforcement. Bond and Chen (1987) extend Ethier's setting to a two-country context, distinguishing between the cases of capital mobility and capital immobility. Woodland and Yoshida (2006) further extend this framework and relax the assumption of immigrants' risk neutrality. They show that non-neutral attitudes to risk may lead to multiple and unstable equilibria. Illegal immigration is reduced by tighter border control and greater internal enforcement. The effect of internal enforcement on the wage rate of illegal workers depends on their attitude to risk. All these papers on illegal immigration rest on the assumption that illegal immigration is always undesired and governments are willing to fight it.

Only recently, some authors have considered that a certain degree of illegal immigration may be deliberately tolerated by governments. Hillman and Weiss (1999) explain permissible illegal immigration in an endogenous policy model where illegality denies immigrants the possibility to freely choose their occupation, making them become sector-specific factors of production. In that setting, the median voter opposes immigration under initial conditions with no illegal immigrants. However, once a population of illegal immigrants has accumulated, the median voter supports increases in illegal immigration, opposes amnesty of existing illegals and opposes increases in legal migration. Hanson and Spilimbergo (2001) examine the correlation between sectoral shocks and border enforcement in the United States. The authors find that border enforcement falls following positive shocks in the sectors that are intensive in the use of undocumented labour. They argue that this finding is consistent with a political economy model in which the level of border enforcement chosen by the authorities is affected by lobbying by different interest groups. Epstein and Heizler(2008) examine the connection between minimum wages, enforcement policy and illegal migration. In their framework, illegal migrants are always paid their reservation wage, and the relationship between optimal enforcement budget and the minimum legal wage depends on the relative strength of workers' unions and capital owners. Fasani (2009) examines the impact of changes in labour demand on the intensity of deportations of illegal migrants from Italy. He finds a negative and significant effect of local employment on deportations and argues that this is consistent with a political economy model in which the government maximizes a weighted sum of workers' and firms' utility, in presence of labour market rigidities. Finally, Facchini and Testa (2010) use a political agency framework to show how illegal immigration arises endogenously as a strategic choice of elected officials that face a trade-off between pleasing the voters and pleasing a pro-immigration lobby. When the policy makers have an information advantage over the public on immigration supply, they announce a certain immigration quota to please the majority but then they relax the enforcement level in order to please the lobby, which leads to illegal immigration.

Our paper follows this recent line of research, i.e. it provides a political-economic rationale for permissive illegal immigration policies. By stressing the link between minimum wages and illegal immigration, this paper is closest in line with Epstein and Heizler (2008). However, our work differs in several respects. First, we analyse optimal migration policy in a general equilibrium framework with labour and capital markets. Second, in our model the policy maker chooses both legal and illegal migration levels. Third, we assume labour markets to be competitive, i.e. employers do not have all power for setting illegal migrants' wages. This assumption leads to different model predictions. In particular, in absence of fines for hiring illegal workers, in Epstein and Heizler (2008), only illegal migrants would be hired, while in our model firms would still hire natives and legal migrants as long as their productivity exceeds the minimum wage. Given that employer sanctions are very small in expected terms[4] and that

[4] Bach and Meissner (1991) warned that "evidence is building that the early effort among employers to comply in response to publicity about the new law and wide-ranging INS contacts is dissolving into complacency as employers experience the low probability of an actual INS visit." For instance, government audits of employers to measure compliance with employer sanctions were at almost 10,000 in 1990, and less than 2,200 in fiscal year 2003 (Brownell, 2005). Even if now employers' sanctions are becoming more stringent, the number of employers actually apprehended is still very small.

natives and legal migrants represent the majority of employees in developed countries, we believe our assumption of competitive labour markets to be more realistic.

In our model, informal employment of illegal migrants may be the only way to increase production in sectors in which labour productivity is below the minimum wage. In order to focus on this simple explanation, we assume away all other differences between legal and illegal migrants. We show that introducing this possibility in a standard immigration model à la Borjas (1995) is sufficient for rationalizing permissive illegal immigration policies in presence of minimum legal wages. Contrarily to Borjas (1995), we show that in this case an immigration surplus may arise also when natives' wage does not fall as a result of immigration. Finally, we also consider a redistributive welfare system and analyse the conditions under which illegal immigration is more convenient than legal immigration as far as its impact on government's budget balance is concerned.

The structure of the paper is as follows. Section 2 presents the model. Section 2.1 considers the benchmark case of competitive labour markets. Section 2.2 considers the case of a minimum wage regulation. Section 3 presents the welfare system extension and section 4 concludes.

2. The Model

We consider an economy populated by N native individuals, indexed by i. They are all endowed with one unit of labour, but they differ in the amount of capital they own, $k_i \geq 0$, where $\sum_{i=1}^{N} k_i = K$.[5] One final good Y is produced by competitive firms with a Cobb-Douglas production function, $Y = K^{\alpha}L^{1-\alpha}$, where K is the quantity of capital and L is the quantity of labour used in production. The price of the final good is normalized to one.

The economy's labour force is composed of natives, legal migrants and illegal migrants. All migrants are endowed with one unit of labour and do not own any capital. We assume that all workers have the same productivity.[6] The number of legal and illegal migrants is determined by the economy's migration policy. While governments do not have perfect control over the number of migrants (and in particular of illegal migrants) entering their country, their policies still play a major role in determining this number. Visa requirements represent a binding constraint on legal migration, as the number of people willing to migrate from developing to developed countries highly exceeds the number of available visas (Clemens, 2011). Other examples of such policies are working permit requirements, constraints on employers hiring foreigners, and citizenship rules. Despite the lower control governments have over illegal migration, policies such as the frequency of border control, workplace inspections, fines, deportations and amnesties, as well as the level of social care to which irregular migrants are entitled, shape individuals' incentives to attempt illegal migration and their chances to actively participate in the labour force once they arrive. Since our interest here is the choice of optimal migration levels – and not the choice

[5] K can alternatively be interpreted as human capital. With this interpretation, firms use skilled and unskilled labour to produce a final good, native workers differ in their skill level and immigrants are all unskilled, as in Ethier (1986).
[6] Clemens (2011) argues, based on existing empirical literature, that most of the differences in productivity between rich and poor countries is due to place-specific factor productivity gaps, and not to differences inherent to workers. Allowing for differences in labour productivity would not change our qualitative results.

among various migration policies for a given target – we do not explicitly model the policy tools used to attain those migration levels (such as visa quotas, border enforcement, internal enforcement, etc.), but we simply define migration policy as a couple (M, I), where M is the number of legal and I the number of illegal migrants participating in the labour force.[7] Thus, labour supply for a given migration policy (M, I) is $L = N + M + I$, and capital supply is fixed and equal to K.

While having the same productivity, legal and illegal migrants differ in that illegal migrants can be hired with informal working contracts. An informal working contract does not need to comply with labour market regulations such as the minimum wage.[8] Minimum wages, determined either by legislation or by collective negotiations, exist in most developed countries but they are often not respected for illegal migrants, usually employed off the books. Informal employment at wages below the minimum also exists among natives and legal migrants, but it is much less frequent than in the case of illegal aliens, since natives are rarely willing to accept such poor working conditions, particularly if the wage is below social security benefits, while legal migrants often need to show formal employment contracts in order to maintain their legal status[9] .

We assume labour and capital markets to be competitive, i.e. no individual worker or firm has the power to influence the market wage or interest rate.[10]

[7] Also, given our focus on the demand side of migration, we do not model migrant's decisions to migrate, nor the impact of legal and illegal migration on origin countries.
[8] Informal contracts also allow employers to avoid paying taxes. Cuff et al. (2011) propose a theoretical analysis of optimal policies in presence of tax evasion and undocumented workers. In this paper, employers' only motivation for hiring illegal migrants is the possibility to avoid the minimum wage regulation.
[9] About two-thirds of undocumented workers earn less than twice the minimum wage, compared with only one-third of all workers (Passel *et al.*, 2004).
[10] In some situations, employers have a certain degree of market power when negotiating the wage with illegal migrants. If migrants have very limited employment options, employers may extract all their rent by paying them their reservation utility. Such a framework has been analysed by Epstein and Heizler (2008).

Firms choose the profit maximising levels of capital and labour. Their demand for labour and capital determines equilibrium wages and interest rate. Firms do not pay any fine for hiring illegal workers.[11] Thus, as long as the minimum wage regulation is not binding, they are indifferent between hiring natives, legal migrants and illegal migrants.

The utility of native i is:

$$U_i = w^*(K, L) + k_i r^*(K, L) - \frac{1}{2}\, \gamma\, [M + (1 + \varphi)I]^2, \tag{1}$$

where $w^*(K, L)$ and $r^*(K, L)$ are respectively the equilibrium wage and the interest rate, and $\frac{1}{2}\, \gamma\, [M + (1 + \varphi)I]^2$, is the non-economic cost of legal and illegal migration, with $\gamma \geq 0$ and $\varphi \geq 0$.

The non-economic cost of migration represents real or perceived negative effect of immigrants on natives, independently of labour and capital markets. These non-economic factors, such as fears about the effect of foreigners on national identity, culture and crime rates, are important determinants of individuals' preferred migration levels (Mayda, 2006). Taking into account that these feelings are usually stronger towards illegal immigrants, and that illegal migrants are less likely to well integrate in the host society due to the fear of being caught and deported, we assume that illegal immigrants entail a higher non-economic cost, i.e. $\varphi \geq 0$. The technical reason for including these costs is that natives' revenues are convex in migration levels. Including sufficiently convex non-economic migration costs allows interior solutions for optimal

[11] Fines for hiring illegal workers are introduced in order to discourage firms from hiring these workers. A number of papers, starting from Ethier (1986), have analysed the effect of such fines on illegal migrants' employment and wages. Our question here is different. We want to determine the optimal number of legal and illegal migrants in the labour force, i.e. the migration levels which maximize a weighted sum of natives' welfare. In this framework, the policy maker has no reason for introducing such fines.

migration levels.[12] For the rest of this paper, we will assume that γ is sufficiently important, i.e. we assume:

$$\gamma > \underline{\gamma} \equiv N^{-2}(K/N)^{\alpha}\alpha(1-\alpha).^{13} \tag{2}$$

The policymaker maximizes a social welfare function equal to a weighted sum of natives' utility. A simple way of aggregating individual preferences into a social welfare function is to assume the capital stock K to be equally distributed among a fraction μ of natives, while the other fraction, $1-\mu$ only have labour endowments. We will refer to these groups as capitalists and workers respectively. Thus $k_i = K/\mu N$ if native i is a capitalist and $k_i = 0$ if native i is a worker. The policymaker maximises a welfare function equal to a weighted sum of the two groups' welfare:

$$W_G = (1-\pi)w^*(K,L) + \pi[w^*(K,L) + (K/\mu N)r^*(K,L)] - \frac{1}{2}\,\gamma\,[M + (1+\varphi)I]^2,$$

where π is the weight that the government attaches to the welfare of capitalists. This weight may depend on government's own ideological preferences, on its interest in being re-elected and on lobbying efforts by each group, which we do not explicitly model.[14] The share μ of capitalists may have either a positive or a negative impact on government's weight π. If government's decisions are highly influenced by electoral concerns, the weight π on the welfare of capitalists will be small when their number is low in order to maximise the number of votes. If government's decisions are highly influenced by lobbying, π will be high when the number of capitalists is low, since smaller interest groups are more likely to coordinate in lobbying activities. We make no particular assumption about the correlation between μ and π.

[12] For a discussion of the convexity issue in standard migration models with a constant returns to scale production function, see Giordani and Ruta (2011).

[13] This assumption ensures that the utility maximization problem admits an interior solution (see proof of Proposition 1).

[14] This weight may also depend on the business cycle, as argued by Shughart et al. (1986).

Let us analyse the migration policy preferred by native i. First, we determine the equilibrium wage and interest rate for a given migration policy (M, I). Second, we compute native i's preferred migration policy (M_i, I_i). Finally, we determine the migration policy which maximises the social welfare function described above.

In section 2.1 we analyze the benchmark case in which wages and interest rates are determined competitively. In section 2.2 we consider the more realistic case in which the labor market is constrained by a minimum wage regulation.

2.1 Migration Policy in Absence of a Minimum Wage Regulation

We assume in this section that wages and interest rates are determined competitively. In this case, natives, legal migrants and illegal migrants are perfect substitutes. Firms hire additional workers as long as their productivity exceeds the wage. In equilibrium, wages and interest rates equal the marginal productivity of labour and capital respectively:

$$w^* = (1-\alpha)\left(\frac{K}{L}\right)^{\alpha} \tag{3}$$

$$r^* = \alpha\left(\frac{L}{K}\right)^{1-\alpha} \tag{4}$$

Let us determine native i's preferred migration policy (M_i, I_i). First, it is easy to see that $\forall i, I_i = 0$, i.e. native i's preferred migration policy implies zero illegal migration, independently of his capital stock. From (1), (3) and (4), we can see that to any policy (M, I), native i strictly prefers the policy $(M+I, 0)$, that allows the same total number of migrants, but where all migrants are legal. The reason for this is that native i's revenues w^* and r^* only depend on the total number of migrants $M+I$, but illegal migrants induce a higher non-economic cost.

Second, let us determine native i's preferred level of legal migration, M_i, taking into account that $I_i = 0$. As migration increases labour supply L and leaves the capital stock unchanged, we can see from (3) and (4) that migration decreases labour revenues and increases capital revenues. Individual i's preferred migration level depends on his capital stock and on the non-economic cost of migration, as shown in Proposition 1.

Proposition 1: *When markets are competitive, native i's preferred migration policy is $(M_i, 0)$, where the level of legal migration $M_i \geq 0$ increases with his capital stock k_i and decreases with the non-economic cost of migration γ.*

Proof. See Appendix.

Proposition 1 implies that a migration policy with a positive level of illegal immigration cannot be optimal, since the utility of all natives could be strictly increased by keeping the total number of migrants constant and replacing illegal migrants with legal ones. Therefore the government maximises W_G with respect to M, taking $I = 0$. Note that the only difference between individual i's and government's utility function is the weight given to the interest rate, which is k_i for individual i and $\pi K/(\mu N)$ for the government. Then, following the exact same steps as in Proposition 1, we can show that the migration policy maximising the social welfare function is a vector $(M^*, 0)$, where M^* is increasing with π and K and decreasing with $N,\ \mu$ and γ. Thus, when markets are competitive, there is no rationale for allowing a positive level of illegal migration, and, in line with previous literature, the optimal level of legal migration depends positively on the weight of capital owners, π, and negatively on the non-economic cost of migration, γ.

2.2 Migration Policy in Presence of a Minimum Wage Regulation

Consider now the more realistic case in which a minimum wage regulation forbids firms to hire workers at wages below w_{min}. If marginal labour productivity is higher than the minimum wage and an additional worker enters the labour market, he will be hired and paid his marginal productivity independently of his legality status. If marginal labour productivity is equal to, or lower than the minimum wage and an additional worker enters the labour market, he will be unemployed if he is a native or a legal migrant, and hired informally, for a wage equal to his marginal productivity, if he is an illegal migrant.

As in the previous section, we first determine the equilibrium wage and interest rate for a given migration policy (M, I), then we analyse native i's preferred migration policy and the welfare maximising migration policy.

Denote by L_{max} the quantity of labour such that marginal labour productivity is equal to the minimum wage: $L_{max} = K((1-\alpha)/w_{min})^{1/\alpha}$. Note that L_{max} decreases with w_{min}. As marginal labour productivity is decreasing, L_{max} is the maximum number of workers that can be employed respecting the minimum wage regulation and $Y(K, L_{max})$ the maximum production level obtainable. We assume that the minimum wage regulation is not binding in absence of migration, i.e. $(1-\alpha)(K/N)^{\alpha} > w_{min}$, which is equivalent to $N < L_{max}$.[15] Let us now analyse the impact of different migration policies on natives' welfare.

A migration policy (M, I) such that $N + M + I < L_{max}$ implies that all workers can be employed formally, as the marginal productivity of the last worker is higher than the minimum

[15] This assumption is not necessary for our results, but it simplifies the exposition.

wage. In this case, the equilibrium wage and interest rate are the competitive ones, given by (3) and (4) and they only depend on the total number of migrants $M + I$. As in the previous section, the welfare of all natives would be strictly higher with the policy $(M + I, 0)$, leading to identical revenues but lower non-economic migration costs for the natives. Therefore such a policy cannot be optimal unless $I = 0$.

A migration policy (M, I) such that $N + M + I > L_{max}$ implies that not all workers present in the country can be employed formally, as the marginal productivity of the last worker is lower than the minimum wage. Since only illegal workers can be employed informally, the equilibrium production, wage and interest rate depend not only on the total number of migrants $M + I$, but also on the number of illegal migrants I. Three cases are possible: $N + M > L_{max}$, $N + M < L_{max}$ and $N + M = L_{max}$.

Consider first the case $N + M > L_{max}$. The marginal productivity of the last worker is lower than the minimum wage. As we assumed that legal migrants and natives cannot be paid below the minimum wage, only L_{max} natives and legal migrants will be employed. It is easy to see why such a policy cannot be optimal. Decreasing the number of legal migrants from M to $L_{max} - N$ and keeping the number of illegal migrants unchanged would not modify the number of workers participating in the labour force, i.e. L_{max} workers employed formally and I workers employed informally. Wages and interest rates would not be affected,[16] but unemployment and the non-economic cost of migration would be reduced and the utility of all natives would be higher.

Consider second the case $N + M < L_{max}$. Then natives, legal migrants and $L_{max} - N - M$ illegal migrants will be employed at the minimum wage, and $I - (L_{max} - N - M)$ illegal

[16] In particular, the wage of natives and legal migrants would remain equal to w_{min} and the wage of illegal migrants would be equal to their marginal productivity.

migrants will be employed at their marginal productivity, lower than the minimum wage. Such a policy cannot be optimal, since replacing $L_{max} - N - M$ illegal migrants with legal migrants would not change the equilibrium wage and interest rates, but it would reduce the higher non-economic cost associated with illegal immigration.

Therefore a migration policy with a positive level of illegal immigration cannot be optimal, unless the number of legal migrants is such that marginal labour productivity is equal to the minimum wage, i.e. $N + M = L_{max}$. Let us now compute natives' revenues when $N + M = L_{max}$ and $I > 0$. In this case, firms will hire all natives and legal migrants at the minimum wage, and informally hire illegal migrants at their marginal productivity. Denote by ${w_I}^*(I)$ and $r^*(I)$ the equilibrium wage of illegal migrants and the equilibrium interest rate when the migration policy is $(L_{max} - N, I)$. The wage ${w_I}^*(I)$ is given by the marginal productivity of the last illegal worker, i.e.:

$$ {w_I}^*(I) = (1-\alpha)\left(\frac{K}{L_{max} + I}\right)^{\alpha} < w_{min} \tag{5} $$

The interest rate $r^*(I)$ is computed by dividing total capital revenues, equal to total production minus total labour remuneration, by the number of units of capital present in the economy.[17] Total production is given by:

$$ Y(K, L_{max} + I) = K^{\alpha}(L_{max} + I)^{1-\alpha}. \tag{6} $$

Total labour remuneration is equal to $L_{max}w_{min} + I{w_I}^*(I)$. Thus, total capital remuneration is given by:

$$ K * r^*(I) = K^{\alpha}(L_{max} + I)^{1-\alpha} - L_{max}w_{min} - I{w_I}^*(I). \tag{7} $$

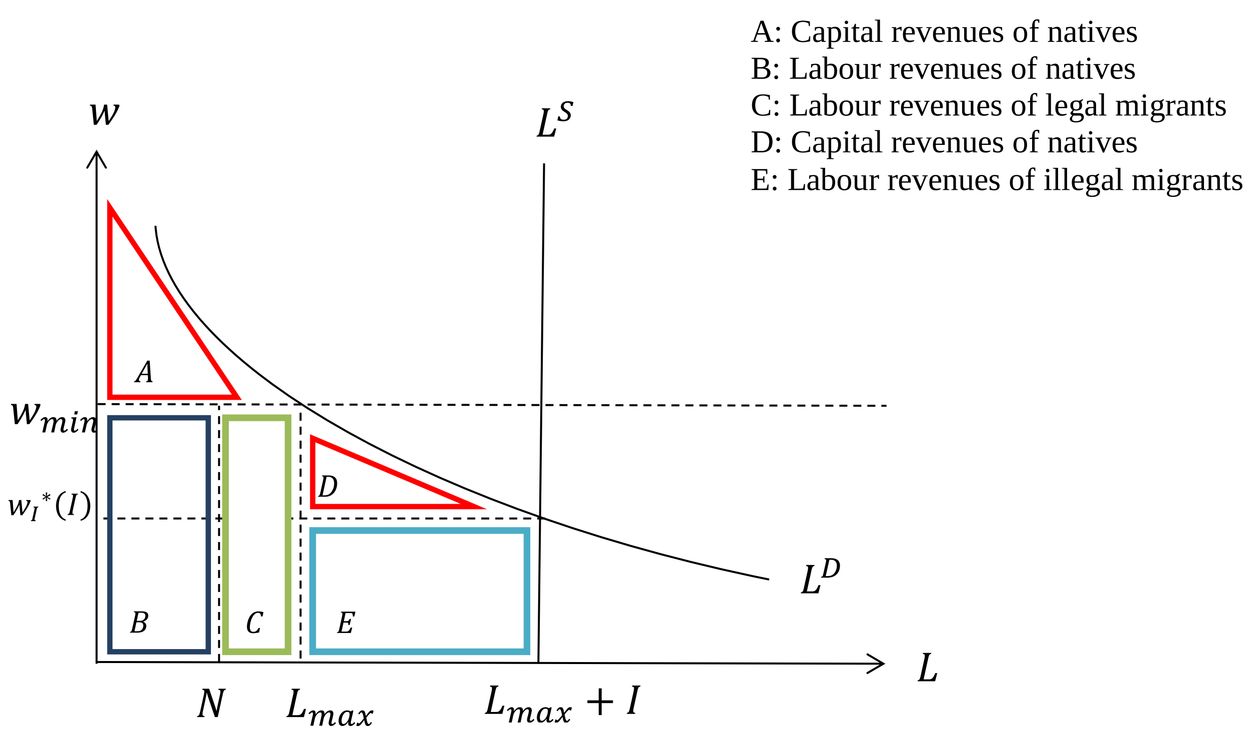
By rearranging the terms and replacing L_{max} with its expression, we have:

[17] With a constant returns to scale production function and competitive firms, profits are zero and the entire production is split between labour and capital revenues.

$$r^*(I) = K^{\alpha-1}\left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}} + I\right]^{-\alpha}\left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}} + \alpha I\right] - (1-\alpha)^{\frac{1}{\alpha}} w_{min}{}^{\frac{\alpha-1}{\alpha}}. \tag{8}$$

Natives' revenues with a migration policy $(L_{max} - N, I)$ are represented in Figure 1.

Figure 1: Labour and capital revenues for a migration policy $(\boldsymbol{L_{max} - N, I})$



We can now compute native i's preferred migration policy. Proposition 2 summarises the results.

Proposition 2: *When labour markets are constrained by a minimum wage regulation, native i's preferred migration policy (M_i, I_i) is such that the level of legal migration M_i increases with his capital stock k_i up to $L_{max} - N$, and I_i is positive if the level of capital k_i is sufficiently high and the cost of illegal immigration φ is sufficiently low .*

Proof. See the Appendix.

Proposition 2 shows that in presence of a minimum wage regulation, individuals with sufficient capital holdings prefer a positive level of illegal immigration. This allows increases in production above $Y(K, L_{max})$ and in natives' capital revenues without hurting their wages, protected by the minimum wage regulation. Natives' preferred level of illegal immigration is only limited by its non-economic cost.

Policy maker's objective function closely resembles the one of native i, except that the weight given to the interest rate is $(K/\mu N)$ instead of k_i. It follows directly that if the government puts a sufficient weight on the welfare of capitalists and if the non-economic cost of illegal immigration is not too high, government's preferred migration policy implies a positive level of illegal immigration.

Our model predicts that all else equal, governments who put a higher weight on capitalists' welfare should tolerate higher levels of illegal migration. However, the same governments should also set lower minimum wages, reducing the need for illegal migration. In order to derive clear empirical predictions with respect to the correlation between minimum wages and illegal migration levels, the minimum wage policy should be endogenized as well.

This section showed that labour market rigidities provide an economic rationale for allowing illegal migrants to participate in the economy. The following section argues that in some cases, the existence of redistributive welfare systems provides an additional reason for policy makers to favour illegal rather than legal migration.

3. Extension

Consider a redistributive welfare system à la Facchini and Mayda (2009), in which the state taxes labour and capital revenues at the same rate τ and distributes individual welfare benefits b. Assume that legal migrants are entitled to the same welfare benefits as natives, while illegal migrants only get a share $\varepsilon \in [0;1]$ of these benefits. This assumption is consistent with the practice of most developed countries, which provide some basic health and education services to all residents, irrespectively of their legality status, but limit other welfare transfers, such as unemployment benefits or housing subsidies, to legal residents only. We also assume that a share μ of illegal migrants pay taxes, to account for the fact that illegal migrants do contribute to the welfare system to some extent, by paying some direct and indirect taxes.

In order to focus on the welfare system, we assume in this section that there are no rigidities in the labor market. Thus, for a given migration policy (M, I), wages and interest rates are the competitive ones, given by (3) and (4).

Government's budget balance is:

$$B = \tau[w^*(K,L)(N + M + \mu I) + r^*(K,L)K] - b(N + M + \varepsilon I) \tag{9}$$

We do not assume that the government's budget is necessarily balanced, but we do assume that the government takes into account the impact of policies on the budget.[18] Suppose the government wants to increase the labour force in order to increase production and profits. In absence of minimum wage regulations, legal and illegal migrants are perfect substitutes in the labour market. However, their impact on government's budget balance is not identical. An

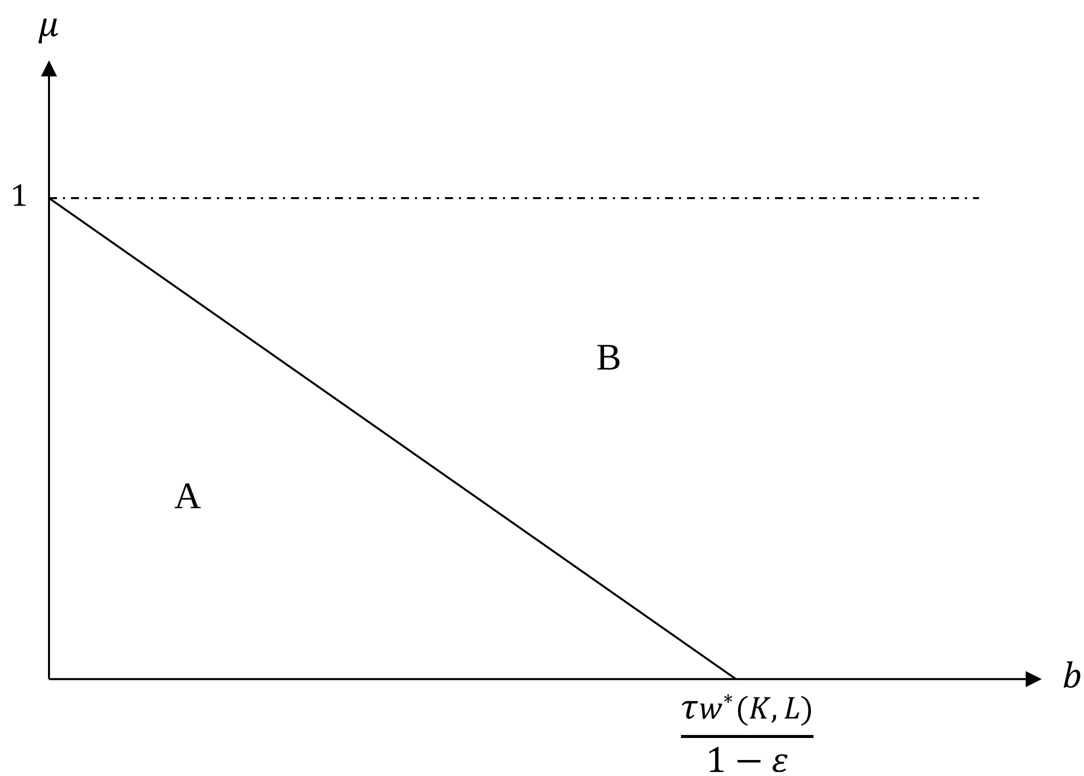
[18] This is a more realistic assumption that the balanced budget constraint. We could alternatively consider a situation in which the tax rate adjusts for a given level of benefits, or the level of benefits adjust for a given tax rate, in order to keep the budget balance constant, as in Facchini and Mayda (2009). We would then compare the impact on tax rates (or on benefits for constant tax rates) of increases in legal and in illegal immigration.

additional illegal immigrant is more beneficial for the budget balance than an additional legal migrant if $\partial B/\partial I > \partial B/\partial M$. One can easily check that is condition is satisfied whenever:

$$b > \tau w^*(K,L)\,(1-\mu)/(1-\varepsilon) \tag{10}$$

Figure 2 plots the combination of parameters for which (10) is satisfied.

Figure 2: Impact of legal and illegal immigration on public finances



A: Legal migrants are more profitable to public finances.

B: Illegal migrants are more profitable to public finances.

A marginal increase in illegal immigration is more profitable to public finances than a marginal increase in legal migration when the tax rate τ is low, when welfare benefits b are high, when illegal migrants are entitled to a small share ε of the welfare benefits, and when an important share μ of illegal migrants pay taxes. If the welfare system satisfies these conditions, governments who want to increase production through immigration but who are concerned about public finances, may opt for increases in illegal rather than legal migration.

4. Conclusion

This paper rationalises the tolerance of some level of illegal immigration by many developed countries. First, we argue that in presence of binding minimum wage regulations, increases in production and capital revenues can only be obtained by informally employing illegal migrants at lower wages. When capital owners have a sufficient influence on migration policy choices, either through lobbying or for ideological reasons, some level of illegal immigration will be purposely tolerated by the authorities. Second, we argue that authorities' concern for public finances may induce them to prefer illegal rather than legal migration when the welfare system has some particular features such as low welfare benefits for illegal migrants and sufficient tax contributions from the latter.

Endogenizing the minimum wage is an interesting direction for future work. One would analyse the policy mix in which the government protects national workers with a minimum wage regulation and pleases capitalists by tolerating employment of foreign workers at lower wages. Such a framework would also allow derivation of testable predictions with respect to the sign of the correlation between minimum wage law and illegal migration.

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Appendix.

Proof of Proposition 1.

We have already shown that for all i, $I_i = 0$. Let us determine M_i, taking into account that $I_i = 0$. First, it is straightforward to check that $\partial U_i/\partial M > 0 <=> k_i > f(M)$, where $f(M) \equiv M(N+M)^\alpha K^{1-\alpha} \gamma/[\alpha(1-\alpha)] + K/(N+M)$. Second, it is easy to check that $f^{'}(M) > 0 <=> g(M) > K^\alpha \alpha(1-\alpha)/\gamma$, where $g(M) \equiv (N+M)^{\alpha+2}[N+(1+\alpha)M]$. As $g(M)$ is increasing in M, if $g(0) > K^\alpha \alpha(1-\alpha)/\gamma$ then $g(M) > K^\alpha \alpha(1-\alpha)/\gamma$ for all M. Third, it is easy to show that $g(0) > K^\alpha \alpha(1-\alpha)/\gamma <=> \gamma > N^{-2}(K/N)^\alpha \alpha(1-\alpha) = \underline{\gamma}$, which is satisfied by assumption (2). Thus, $f^{'}(M) > 0$ for all M. If k_i is such that $k_i < f(0) = K/N$, i.e. individual i has a lower than average capital stock, then as $f(M)$ is increasing, $k_i < f(M)$ for all M and thus $\partial U_i/\partial M < 0$ for all M. In this case individual i's utility function decreases with M so $M_i = 0$. If $k_i > f(0) = K/N$, then as $f(M)$ is continuous, $\partial U_i/\partial M > 0 <=> M < M_i$, where M_i is given by $k_i = f(M_i)$. From this equality and the expression of $f(M)$, it is easy to check that an increase of k_i and a decrease of γ both imply a higher M_i.

Proof of Proposition 2.

We have already shown that the only possible optimal migration policies (M, I) are such that $M < L_{max} - N$ and $I = 0$ or $M = L_{max} - N$ and $I \geq 0$.

First, Proposition 1 implies that natives with sufficient capital holdings prefer the policy $(L_{max} - N, 0)$ to $(M < L_{max} - N, 0)$.

Second, let us show that natives with sufficient capital holdings prefer the policy $(L_{max} - N, I > 0)$ to $(L_{max} - N, 0)$.

When $M = L_{max} - N$ and $I \geq 0$, the utility of native i is given by:

$$U_i = w_{min} + k_i r^*(I) - 1/2\gamma[L_{max} - N + (1+\varphi)I]^2$$

In the following 4) steps, we will check that this utility function is maximised for a strictly positive I when k_i is sufficiently high and φ sufficiently low.

1) Define the following functions and thresholds:

(A1) $$h(I) = (1-\alpha)I\left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}} + I\right]^{-\alpha-1} - \frac{\gamma(1+\varphi)^2}{k_i K^{\alpha-1}\alpha} I;$$

(A2) $$g(I) = \left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}} + I\right]^{-\alpha-2}\left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}} - \alpha I\right];$$

(A3) $$H = \frac{\gamma(1+\varphi)}{k_i K^{\alpha-1}\alpha}\left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}} - N\right];$$

(A4) $$G = \frac{1}{1-\alpha}\frac{\gamma(1+\varphi)^2}{k_i K^{\alpha-1}\alpha}.$$

2) The functions $h(I)$ and g(I) satisfy the following properties:

(A5) $$h(0) = 0;$$

(A6) $$h(I) \underset{I\to\infty}{\longrightarrow} -\infty;$$

(A7) $$g(0) = \left[K\left(\frac{1-\alpha}{w_{min}}\right)^{\frac{1}{\alpha}}\right]^{-\alpha-1} > 0;$$

(A8) $$g(I) \underset{I\to\infty}{\longrightarrow} 0.$$

3) The following equivalences are satisfied:

(A9) $$\partial U_i/\partial I > 0 <=> h(I) > H;$$

(A10) $$\partial h(I)/\partial I > 0 <=> g(I) > G;$$

(A11) $$\partial g(I)/\partial I > 0 <=> I > 2/\alpha K((1-\alpha)/w_{min})^{\frac{1}{\alpha}};$$

(A12) $$g\left(2/\alpha K((1-\alpha)/w_{min})^{\frac{1}{\alpha}}\right) < 0.$$

(A8), (A11) and (A12) imply that imply that $g(I)$ is maximized for when $I = 0$.

4) Two cases are possible: either $g(0) > G$ or $g(0) < G$.

Case 1: $g(0) > G <=> \gamma(1+\varphi)^2 < \alpha(1-\alpha)k_i K^{-2}\left[\frac{1-\alpha}{w_{min}}\right]^{\frac{-\alpha-1}{\alpha}}$.

As $g(I)$ is continuous and $G > 0$, (A8), (A11) and (A12) imply that $\exists! I_G$ such that $g(I) > G$ if and only if $I < I_G$. Then (A10) implies that $\partial h(I)/\partial I > 0 <=> I < I_G$, so $h(I)$ is maximised in $I = I_G$. Two sub cases are then possible: either $h(I_G) < H$ or $h(I_G) > H$.

Case 1.1: $h(I_G) < H$. As $h(I)$ is maximised in $I = I_G$, this implies that $h(I) < H \ \forall I$. Then (A9) implies $\partial U_i/\partial I < 0 \ \forall I$, so U_i is maximised for $I = 0$. Thus in this case $I_i = 0$.

Case 1.2: $h(I_G) > H$. As $h(I)$ is continuous and first increasing, then decreasing in I, this implies that $\exists \underline{I_H}, \overline{I_H}$ such that $h(I) > H$ for all I such that $\underline{I_H} < I < \overline{I_H}$.Then (A9) implies that $\partial U_i/\partial I > 0$ for all I such that $\underline{I_H} < I < \overline{I_H}$. In this case the utility function U_i is first decreasing, then increasing, then decreasing again in I. It is maximised either in and $I = 0$ or in $I = \overline{I_H}$. U_i is maximised in $\overline{I_H}$ if and only if $U_i(0) < U_i(\overline{I_H})$, which is equivalent to $1/2\, \gamma(1+\varphi)\overline{I_H}[2(L_{max} - N) + (1+\varphi)\overline{I_H}] < k_i[r^*(\overline{I_H}) - r^*(0)]$.. As $r^*(I)$ is an increasing function of I, this is conditions satisfied when k_i is sufficiently high and φ sufficiently low.

Case 2: $g(0) < G <=> \gamma(1+\varphi)^2 > \alpha(1-\alpha)k_i K^{-2}\left[\frac{1-\alpha}{w_{min}}\right]^{\frac{-\alpha-1}{\alpha}}$.

As $g(I)$ is maximized for when $I = 0$, this implies that $g(I) < G$ for all I. In this case $\partial h(I)/\partial I < 0$ for all I. Then (A5) implies that $h(I) < 0$ for all I. As $H > 0$, $h(I) < H$ for all I. Then $\partial U_i/\partial I < 0$ for all I, so $I_i = 0$.

To sum up, the utility of native i is maximised for a strictly positive level of illegal immigration when k_i is sufficiently high and φ sufficiently low.